

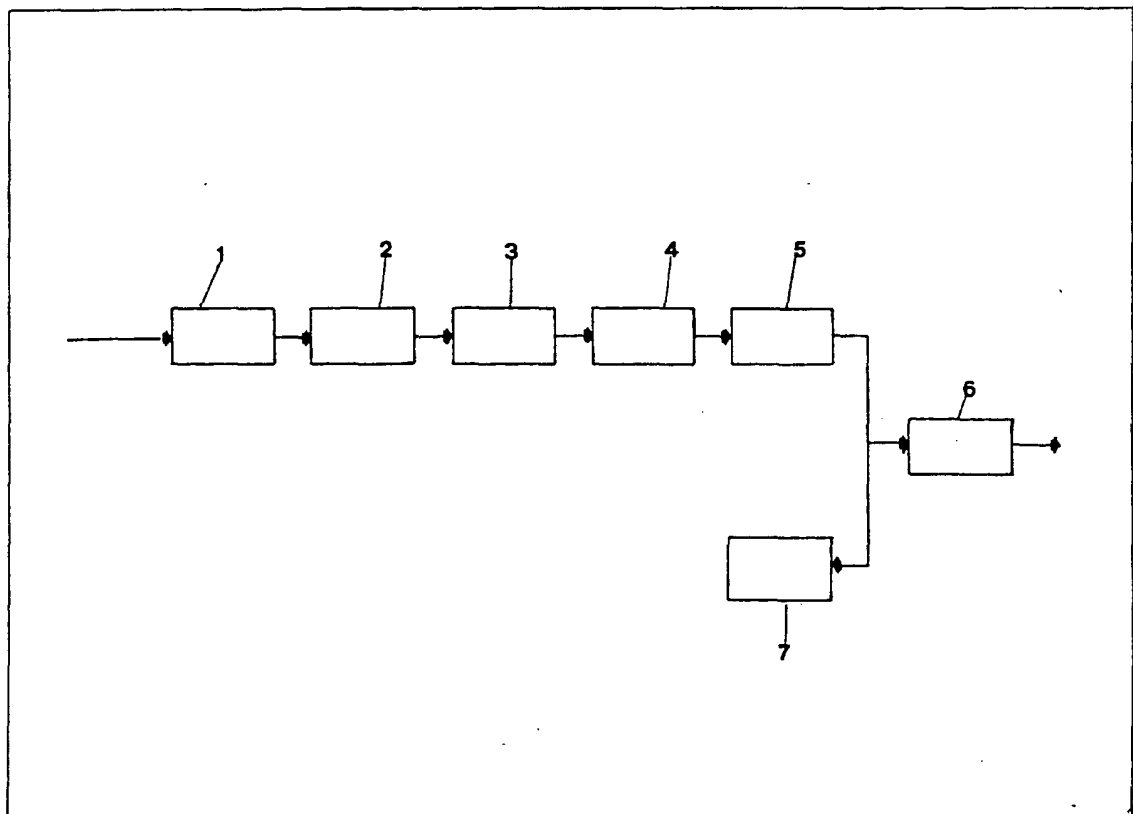
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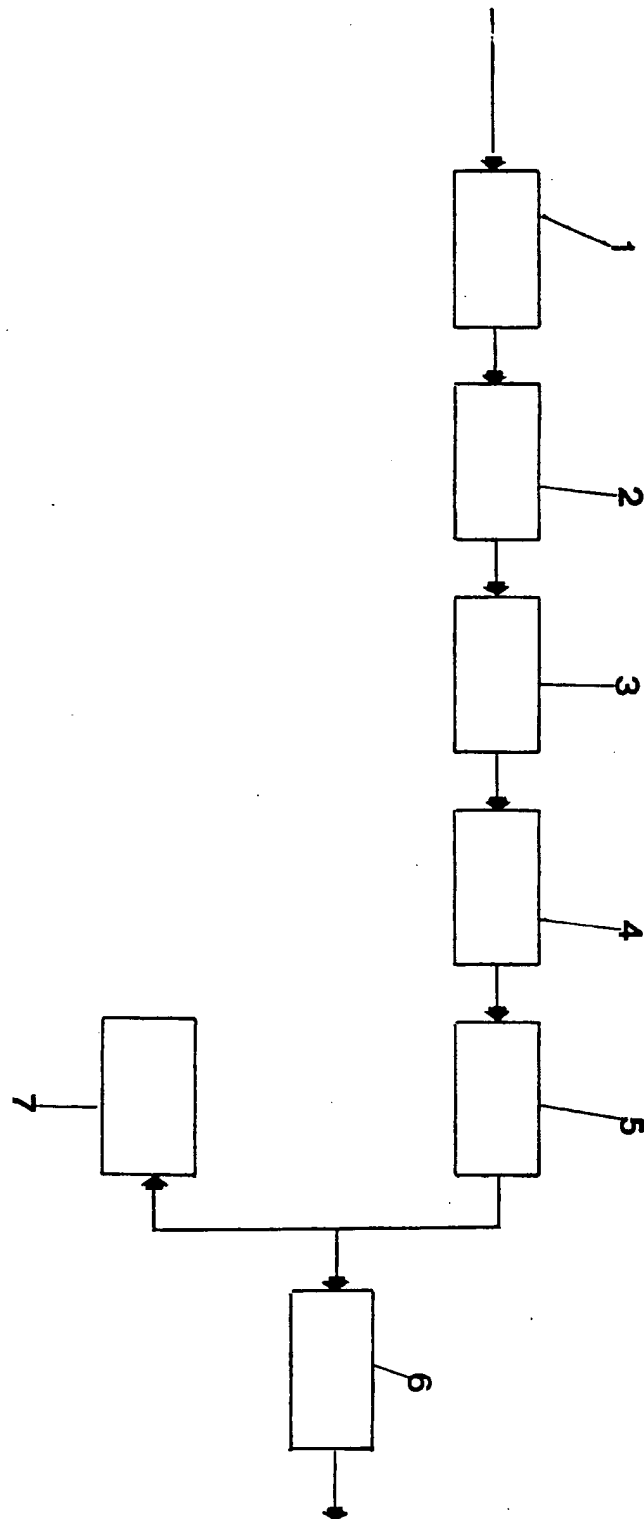
(54) Process and plant for the  
production of a solid fuel utilizing  
town solid waste and trash

(57) The plant comprises a selecting  
station (1) where the light fractions of  
the urban solid waste are selected,  
these light fractions comprising  
essentially paper, cardboard, plastics  
film, wood and rags. The selected

waste product then passes  
successively through a milling station  
(2), a moisture-regulation station (3),  
a homogenization and mixing station  
(4) and an optional adding station (5)  
where substances are added to render  
the products of combustion of the fuel  
non-noxious. The particulate waste  
product may then be pelletized in a  
station (6) or stored in a silo at a  
station (7).



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# SPECIFICATION

**Process and plant for the production of a solid fuel utilizing town solid waste and trash**

## TECHNICAL FIELD OF THE INVENTION

- 5 The invention relates to a process and to a plant for the production of a solid fuel utilizing town solid waste and trash.

## BACKGROUND ART

- 10 It is known that, at present, the urban solid waste and trash is treated according to two basic systems. One of these systems involves the incineration of the waste by means of suitable incinerating apparatuses and, according to the other system, the waste itself is subjected to a series of operations intended to permit the recovery and recycling of the re-utilizable materials composing the waste itself.

- 15 In the first case we get an almost complete destruction of all the collected materials, with the relevant loss and with an attendant production of combustion and gaseous products which, from an ecology standpoint, may be noxious, above all owing to the heterogeneity of the components.

- 20 In the second case a series of products is obtained which can be re-utilized in some way. In connection with this technology, reference is made to the numerous patents which are the property of "Sorain Cecchini SpA" in which devices and systems have been devised and improved for the treatment of the urban solid waste in view of the recycling and re-utilizing of their components.

- 25 When selecting certain constituents from the town solid waste, various products can be obtained, as is known, among which products are plastics, plasticized paper, threads of rags, and so on, i.e. a highly combustible and low density material can be obtained. Among all these combustible materials there are some materials which can be re-utilized as fuel, while other combustible materials must be separated in order to avoid the formation of combustion products and of products which are noxious or toxic because of their chemical composition. In other words in order to re-utilized, as a solid fuel, urban solid waste, it is necessary to start from selected products which are composed of combustible materials which, however, must not be toxic, or anyway noxious from an ecological standpoint, per se or through chemical transformations.

## DISCLOSURE OF THE INVENTION

- 30 Among the objects of the invention is to provide an improved process in which the disadvantages of the prior art processes are at least substantially overcome.

- 35 According to a first step of the process of the invention, the urban solid waste is classified by choosing and extracting from the solid waste, waste paper, for example, by means of a cyclone, light plastic fractions in film form substantially or polyethylene, fragments of rags, and so on, with the exclusion of those substances which are toxic

per se or may form toxic compounds owing to the action of heat or because of association with other products which are contained within the urban solid waste.

- 65 Among the materials which should be eliminated, we may mention, for instance, polyvinyl chloride, of which about 98% occurs in the form of relatively heavy bodies, although this substance is per se combustible.

- 70 According to succeeding steps of the process of the invention, the selected portion of the urban solid waste, composed of the above said light fractions, is subjected to a crushing process, that is to a process of reduction into extremely minute particles, as small as possible, and this material, so crumbled, is treated in order to reduce its moisture percentage to a pre-fixed level. This phase of the process is needed and important since the urban solid waste has a variable moisture content as a consequence of its various originating sites and of the weather conditions, the moisture content also varying as a function of the situations in which the waste is collected, that is as a function of conditions which practically vary continuously from one day to another.

- 75 In an embodiment of the process of the invention, after the reduction of the moisture content of the chosen light fractions, which are already in the crumbled condition, the mixture thus obtained is homogenized and, after an analysis of the average chemical composition of the obtained mixture, one can proceed, or not, to add various substances, in such a way that, on the occasion of the succeeding combustion, the effluents will be, in every case, controlled from the ecological standpoint.

- 80 An embodiment of the invention is hereafter described, by way of example, with reference to the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

- 85 The single figure of the drawing is a block diagram of a process of plant according to the present invention.

## BEST MODES FOR CARRYING OUT THE INVENTION

- 90 With reference to the said drawing, the urban solid waste, treated in a suitable selection or classifying station, and from which only the light fractions are withdrawn, mainly composed of paper, plastics film (in particular polyethylene), fragments of rags, wood, and so on, that comprise highly combustible material, but with exclusion of material such as polyvinyl chloride, which during the succeeding treatment and the succeeding combustion may give birth to toxic or ecologically noxious products, it is transferred to a milling station 2, where it is reduced into extremely fine or small particles. The ideal would be to obtain a completely pulverulent mass, but such a condition is unattainable since it is impossible to reduce plastics film or similar substances into a pulverulent form. It is, therefore, sufficient that at the station 2 the material to be treated be reduced

into extremely minute or small particles.

Successively, from the milling station 2 the mass is conveyed to a moisture-regulating station 3.

At a successive station 4, the moisture-controlled product is homogenized and mixed, in order to obtain a mass having the maximum possible uniformity. The succeeding station 5 is an optional station, wherein the milled moisture-regulated product, homogenized and mixed, undergoes an optional addition of chemical or other products selected so as to cause a control of the products of combustion of the material so that they are non-toxic or otherwise ecologically noxious. When leaving the station 5, the obtained, completed product may follow either one or two different paths, that is, it may be sent to pelletization at station 6, through which the product undergoes a substantial increase in its specific gravity, so that an economic convenience is achieved for transport, even over relatively long distances. The conditioning imparted to the product of the previous stations allows a long conservation time of the product which would be otherwise unattainable owing to the general conditions of the starting material. Instead of being forwarded to pelletization at station 6, the material may be directly conveyed to silos at station 7 and be stored in bulk.

From station 7 the material may be forwarded, in bulk condition, directly to utilization plants, that is to the burners, and burnt in this condition. The pelletized product will take preferably the shape of small cylinders, and may be stored as such, or else it may be immediately sent, within suitable containers, for utilization, that is to burners which may be remote from the production site. The pellets may be burnt as such or they may be subjected to successive crushing operations and then burnt.

As it has been said in the preceding description, the treatment process for a selected portion of the urban solid waste to obtain a combustible product offers remarkable advantages and allows for recovery of a material which is rich from the caloric standpoint, but which, in presently used method is generally lost, this causing also a contamination risk for the atmosphere. As has been mentioned, the main feature of the fuel obtained by the process according to the invention consists in the fact that from the materials constituting the urban solid waste those materials are excluded, by a selection, which either per se, or by the effect of their chemical combination with the other products present among the urban solid waste, would give rise to toxic or noxious substances; in particular, polyvinyl chloride is excluded. Naturally, light fractions have been selected, these light fractions not excluding cardboards, but excluding all those other lightweight substances which are contained within the above-said waste and which are incombustible or are combustible but with noxious effects.

Furthermore, a basic feature of the fuel according to the invention is the qualitative

constancy, which allows for a uniform behaviour during the combustion phases, such to assure constant temperatures and, at the same time, of a high level, to thus afford an ideal exploitation under the best possible ecologic conditions, and with the production of a particularly small amount of ash, which, too, will be devoid of unburnt parts and will be, furthermore, smooth running to facilitate discharge.

The process and plant have been described and illustrated with the aid of a block flow diagram, since the machines, apparatuses and devices which are suitable for the realization of the various operations at the process stations are of the types which may be practically found in the industry and do not require constructions and particular modifications out of the scope and capabilities of workers of the art.

It is obvious that, both in the process and the plant, variations may be made which represent modifications which are within the scope of the appended claims.

Without necessarily limiting the scope of the invention claimed, preferred embodiments of the invention may be summarised as follows:—

1. A process for the production of a solid fuel utilizing the urban (town) solid waste, characterized in that from the mass of urban solid waste the light fractions are selected, which are essentially formed by paper, cardboard, plastic film, wood, rags, and similar, said light fractions being subjected to a milling operation and, successively, to a regulation or control of the moisture contents.

2. A process according to Summary 1, characterized in that the moisture-controlling phase is followed by a homogenization and mixing phase, and optionally an addition phase of substances apted to modify the products of the combustion which takes place afterwards, in such a way to prevent that said products may be toxic or anyway ecologically noxious.

3. A process according to Summaries 1 and 2, characterized in that the obtained combustible product is subjected to pelletization to the end of causing an increase of the specific gravity, in such a way to permit an economic transport to areas remote from the production place.

4. A plant for the realization of the process of the Summaries 1 to 3, characterized in that stations are foreseen in which the previously selected material is subjected to a milling operation, then is regulated in its moisture contents, homogenized and mixed, and optionally added with substances adapted to modify the structure or the chemical condition of the combustion products resulting from the combustion of the fuel itself, the moisture regulating phase achieving, apart from other benefits, the advantage of preventing the formation of fungi and the fermentation of the ensile fuel product.

5. A plant according to Summary 4, characterized that the pelletized product is utilized as such or after successive repeated crushing

actions, while the product in bulk can be directly utilized when arriving from the silos, in the burners, near to the production places.

- 5 6. A plant according to one or more of the preceding summaries, characterized in that the obtained product is recovered from the fraction having a high calorific value of the urban solid waste and, therefore, permits a combustion faultless and taking place at high and constant  
10 temperatures, such that the combustion gases can present themselves under the best possible conditions, without the characteristic changes associated with an irregular combustion.

- 15 7. A plant according to one or more of the preceding summaries, wherein the residual ashes are present in very reduced amount and are, above all free of unburnt parts and are easily flowing, which permits an easy and ready utilization of the obtained fuel.

- 20 8. A process and a plant for the production of a solid fuel utilizing the urban solid waste according to one or more of the preceding summaries, substantially as described and illustrated.

- 25 Although reference numerals have been used in the appended claims to improve the intelligibility of these claims, it is expressly stated that these reference numerals should not be construed as limiting the claims to the constructions illustrated in the accompanying drawing.

### 30 CLAIMS

1. A process, for the production of solid fuel from urban solid waste, comprising the steps of:  
selecting from the urban solid waste the light fractions which are essentially composed of paper,  
35 cardboard, plastics film, wood and rags;  
milling the light fractions; and  
controlling the moisture content of the milled light fractions.

- 40 2. A process, according to Claim 1, in which the product obtained from the moisture-controlling step is subjected to a homogenizing and mixing step.

3. A process, according to Claim 2, in which the

- product obtained from the homogenizing and  
45 mixing step is subjected to an adding step where a substance or substances is/are added to control the products of combustion of the fuel so that they are not ecologically noxious.

4. A process, according to Claim 2 or Claim 3,  
50 in which the product obtained from the homogenizing and mixing step or from the adding step is subjected to a pelletization step to increase its specific gravity.

5. A process, according to Claim 2 or Claim 3 in  
55 which the product obtained from the homogenizing and mixing step or from the adding step is subjected to a storage step in which it is stored in a silo.

6. A process for the production of solid fuel  
60 from urban solid waste, substantially as hereinbefore described with reference to the accompanying drawing.

7. A plant, for carrying out the process according to Claim 1, comprising a selecting station (1) for  
65 selecting the light fractions, a milling station (2) for milling the light fractions, and a moisture-control station (3) for controlling the moisture content of the milled light fractions.

8. A plant, according to Claim 7, also including  
70 a homogenizing and mixing station (4) for homogenizing and mixing the product obtained from the moisture-control station. (3).

9. A plant, according to Claim 8, including an adding station (5) for adding a substance or  
75 substances to control the products of combustion of the fuel so that they are not ecologically noxious.

10. A plant, according to Claim 8 or Claim 9, including a pelletization station (6) for pelletizing  
80 the product obtained from the homogenizing and mixing station (4) or from the adding station (5).

11. A plant, for the production of solid fuel from urban solid waste, substantially as hereinbefore described, with reference to the accompanying  
85 drawing.

12. Solid fuel whenever obtained by the process or the plant according to any one of the preceding claims.

